

# Program Directive

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3-06-95

## PARAMETERS FOR AUTOMATED MONITORING AND SUPERVISION OF OFFICIAL WEIGHING

### 1. PURPOSE

This Program Directive establishes a list of parameters for developing an automated monitoring system. This system will produce necessary documentation and incorporate necessary safeguards such that automated official grain weighing and material handling systems can be operated without 100 percent official physical supervision. This can be accomplished by installing an approved Federal Grain Inspection Service (FGIS) Federal Control System (FCS). FGIS makes no effort to dictate specific design of the system; however, each FCS must meet the requirements of FGIS regulations and instructions and will be inspected and tested by FGIS prior to approval for official use. On November 10, 1993, FGIS published Program Directive 916.2, "Implementation of Automated Official Monitoring and Control Systems," which provides guidance for implementation of these projects.

### 2. INSTRUCTIONS

This Program Directive replaces the informal list of parameters provided to interested grain elevators and contractors for use in developing automated monitoring systems.

### 3. POLICY

It is FGIS policy to encourage the grain industry to automate weighing, sampling, and material handling systems to assist in improving the efficiency and effectiveness of official service.

Distribution:

A,C,E,G

Originating Office:

FM, WEB

#### 4. AUTHORITY

Authority to provide this service is included in the United States Grain Standards Act, as amended (USGSA) in Section 7A (a), (b), (c)(1), and the regulations and instructions written thereunder.

#### 5. BACKGROUND

Official grain weighing is required under the USGSA to ensure accurate and correct operation of grain scales and related grain handling equipment and to document official weighing. Official supervision and monitoring requires observing and documenting performance of the weighing and material handling system. Weight logs, scale record logs, printed scale tapes, scale test reports, video recording, etc., can be used to verify that performance. The following parameters have been developed and sent to interested grain elevators and contractors for use in developing new systems. These parameters are guidelines and are not intended to be, nor can they be, all-inclusive, due to the wide differences between elevator designs and material handling equipment used.

It has come to FGIS' attention that there has been some confusion in the interpretation of these parameters. In an effort to clear up confusion, the following parameters include examples of methods, equipment, and procedures that have been found acceptable by FGIS on past approved systems.

In order to eliminate the need for an FGIS weigher to be physically present during official weighing, all the duties and tasks of that position must be performed automatically by the FCS or other official personnel. Only FGIS has the authority to determine whether its regulations and instructions are being met.

The parameters in this Program Directive may be expanded as FGIS finds necessary to accomplish its purpose.

#### 6. SYSTEM PARAMETERS

a. Basic System Parameters. Basic system parameters shall include, but not be limited to, the following:

- (1) The system shall be relatively SIMPLE to operate. (Consideration must be given to physical layout of equipment, facility workload, and ease of operation when integrating weighing and inspection services.)

- (2) The system SHALL NOT be accessible to elevator personnel except for operational controls expressly designed for their use. (Security is a major consideration in approving the system. Physical security, i.e., key locks or seals, is recommended.)
- (3) The scale system shall meet or exceed all the appropriate specifications and tolerances of the National Institute of Standards and Technology (NIST) Handbook 44, (1989 Edition) as defined by FGIS. (FGIS is presently in the rulemaking process of adopting the 1992 edition of NIST Handbook 44. This should not pose any problem for weighing systems presently approved.)
- (4) The system shall be under the complete control of FGIS at all times. (The system shall be secure from use or intervention except when authorized by FGIS.)
- (5) The system shall provide visual indications and a printed record of all elevator operations necessary to ensure correct operation as defined by FGIS. (Graphics shall be provided which show the entire official material handling system's critical paths and the designation and position of all movable devices such as gates, slides, basket valves, turn heads, etc. Belt, drag, leg movement, and grain flow shall be displayed as close to real time as possible.)
- (6) The system shall be designed so that no data or information can be lost during standard operating procedures or in the event of a power failure. (Uninterruptible power supplies are suggested and have been used successfully.)
- (7) Equipment design incorporating self-diagnostic checks such as ensuring the integrity of the official material handling system and weighing system, and ensuring proper operation of the grain sampling equipment is strongly encouraged. (Automatic self-diagnostic checks are encouraged. A record of these checks is required.)
- (8) The system shall provide an audible/visual alarm, print a record, and stop operation should the weighing, mechanical sampling, or material handling system fail, operate out of sequence, or operate

incorrectly. (Alarms shall be visual and audible, and distinguishable from one another, if necessary.)

- (9) The system shall provide for weighing documentation as defined by FGIS and required in Chapters 1, 2, and 3 of the Weighing Handbook. In addition, an "Events Log" shall be produced which will provide a chronological record of all events. (An event is defined as any incident, occurrence, milestone, happening, phenomenon, or action requiring documentation, as defined by FGIS.)
- (10) The system shall be capable of determining when a component and subplot is reached as outlined in the Grain Inspection and Weighing Handbooks, and capable of consecutively numbering and recording sublots.
- (11) Input/Output devices used in the system shall be reliable and of high quality; i.e., printers, monitors, etc. (Automated printing of official documents such as official weight certificates requires exact registration on the form. This has produced minor problems in the past.)
- (12) The system shall be capable of operating for other than official weights, if necessary. (The ability to perform unofficial weighing, transferring grain, etc., if necessary, must be designed into the system so that it does not compromise FGIS system security.)
- (13) The system should be designed to accept modifications necessary to facilitate changes in elevator operations or FGIS procedures. (Systems installed to date have required modifications at the time of installation to meet elevator and FGIS requirements.)

b. Weighing System Requirements. The scale system shall include, but not be limited to, the following specific requirements as defined by FGIS:

- (1) The scale system shall have National Type Evaluation Program (NTEP) approval. (Caution should be taken when modifying or adding to an approved NTEP scale system so as not to damage the approval. Modifications to approved NTEP systems must be re-approved by NTEP and/or FGIS.)
- (2) The system shall meet the appropriate requirements of FGIS regulations (parts 800, 801, and 802), the Mechanical Sampling

Systems Handbook, and instructions as listed in Chapters 1, 2, and 3 of the FGIS Weighing Handbook.

- (3) The scale system shall incorporate an automated testing system capable of accuracy and linearity testing to capacity. (Consideration should be given to provide automated means of buildup testing and strain testing in order to obtain maximum levels of efficiency during normal equipment testing procedures.)
- (4) Time and date shall be incorporated internally in the system for recording as required (hours, minutes, seconds) and be set only by FGIS. Consecutive numbering shall be maintained during a power failure. (Synchronization of all clocks in the system shall ensure that all documentation recorded with time can be used to accurately reconstruct official operation of the system.)
- (5) The scale system shall be capable of printing a minimum of an original and one copy of the following information in a format approved by FGIS. (FGIS recognizes that elevator operations vary widely and that special considerations may be necessary under special circumstances.)
  - (a) Elevator name and location.
  - (b) Designated scale number.
  - (c) Time of each draft.
  - (d) Date at the beginning of each automatic series of weighing and at a date change.
  - (e) Mode of operation in alpha characters only.
  - (f) Gross weight of each draft.
  - (g) Tare weight of each draft.
  - (h) Accumulated weight of each draft.
  - (i) Sublot number (0-99) at the beginning of each sublot.

- (j) Sublot size.
  - (k) Preset draft size.
  - (l) Alarm conditions and time of alarm conditions.
  - (m) Recording of corrective actions taken to relieve alarm conditions.
- (6) Control wiring between the scale console and remote scale equipment such as gate solenoids, limit switches, and level detectors shall be under FGIS' control. There shall be no electrical contacts or other devices in series with scale control wiring unless those devices (i.e., programmable controllers) are under the complete control of FGIS, including hardware and software. Wiring junction points, such as terminal strips, must be capable of being sealed with security seals provided by FGIS.
- (7) Input and output wiring for load cells shall be installed in separate conduit between the scale and control console. Load cell junction boxes shall be capable of being security sealed by FGIS. Multiple scale installations may use common conduit for all load cell input and output wiring.
- c. Basic Security Requirements. The system shall be made secure from security breaches as defined by FGIS, resulting from, but not limited to:
- (1) Irresponsibility - willfully or accidentally causing damage to the system, such as deletion or corruption of data files;
  - (2) Probing - exploiting an inherent weakness in the design of a system to intentionally seek access to protected data, controls, or permissives; or
  - (3) Penetration - intentional breaking of system security for the purpose of gaining access to protected data, controls, or permissives.
- d. Specific Control System Requirements. A material handling system interfaced with the weighing system shall include, but not be limited to, the following specific requirements as defined by FGIS:
- (1) Provisions shall be made to automatically ensure that all grain offered for official inbound weights is delivered from the carrier to the scale and all grain offered for official outbound weighing is

delivered from the scale to the carrier and properly stowed. (All critical paths and diversion points must be automatically monitored by the FCS. Typically, this has been accomplished by using a programmable logic controller (PLC) under the security of FGIS.)

- (2) Provisions shall be made to ensure that all exported grain is officially weighed. Automatic diverter-type grain sampler operation monitoring shall be included in the official record.
- (3) Provisions shall be made to ensure that once official automatic operation has been initiated, any change in the preset conditions of the material handling system or weighing system shall cause an alarm to indicate visibly and audibly, record on the event printer, and stop the weighing operation. (Diversion points should be controlled and automatically monitored to eliminate time-consuming physical checking by official personnel.)
- (4) Shipping bin discharge permissive switches shall be under the complete control of FGIS.
- (5) Provisions shall be made to ensure proper automatic purging of all belts, drags, legs, etc.

e. Basic Operator Interface Requirements. Basic operator interface requirements shall include, but not be limited to:

- (1) A visual graphic display of the material handling system, including all components (i.e., belts, drags, legs, mechanical or automated diversion points, etc.), shall be provided to verify flow paths. The present operating condition (on/off position) of gates or valves (open/closed) shall be clearly indicated and automatically monitored.
- (2) The video graphic display of the material handling system shall be designed to be displayed on one screen, whenever possible. Multi-screen material handling system displays shall have a screen update time of 5 seconds or less (screen to screen.)
- (3) Input and output devices shall be of high quality and easily operated. (Keyboards shall have permanent key markings and dust

covers, if necessary. Tracball rather than mouse operation is recommended hardware.)

- (4) Terminals not under direct FGIS control shall have "view only" access to the system.

f. Automatic Checking Parameters. The system shall provide for, but not be limited to, the following automatic check functions:

- (1) The system shall provide for time to be printed to the nearest second and for all clocks in all components of the system to be automatically synchronized at least three times in a 24-hour period at the beginning of each shift.
- (2) The system shall provide for automatic monitoring of tare weights as described in the FGIS Weighing Handbook. Erratic or unusual tare conditions shall cause an alarm and print a record of the alarm condition.
- (3) The system shall provide for the automatic checking for leaks in upper garner and scale gates at least once per 8-hour period. Automated gate leak checks and possible gate leak conditions shall cause an alarm and a record of such conditions.
- (4) The system shall provide for lifting of scale test weights with a prompt for official personnel to monitor the test. An interlock shall be provided to ensure that test weights cannot be lifted on a scale while the scale is performing official weighing.

g. Closed Circuit Television (CCTV) - Time-Lapse Recording (TLR) Requirements. CCTV and TLR incorporated into the official system shall meet the following requirements:

- (1) CCTV shall be in compliance with FGIS Program Directive 916.1.
- (2) TLR incorporated into the official system shall meet the following requirements:
  - (a) Commercial quality.
  - (b) Industrial grade packaging.
  - (c) VHS compatible.



- (d) Automatic head cleaner.
- (e) Minimum 7-day timer.
- (f) Time lapse recording capability of 480 hours.
- (g) *Horizontal resolution minimum 240 lines in color and 300 lines in black and white.*
- (h) Built-in time and date generator with battery backup of 7-day minimum.
- (i) Connectors for direct input of camera switchers.
- (j) Electronic hour meter.
- (k) Precise tape read counter.
- (l) Controlled timed switching on a sequential switcher.
- (m) Operating temperature: 41° to 104° F.
- (n) Operating humidity: 35 to 80 percent.
- (o) Recording time modes: 2/6 hours (S-VHS and VHS mode).

Example of acceptable equipment: Panasonic Model AG-6030.\*

- (3) The multiplex switcher shall be capable of switching up to eight simultaneous inputs by frame switching for VCR recording. It shall be capable of continuous video playback of a selected individual camera input from the multiple inputs recorded on the tape. It shall have built-in programmable sequence switching with a separate output to permit normal operator viewing of video inputs.

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\*The mention of firm names or trade products does not imply that they are endorsed or recommended by the U.S. Department of Agriculture over other firms or similar products.

Example of acceptable equipment: Panasonic Model WJ-FS10.\*

**h. Printer Parameters.**

(1) Printers used with the weighing system or automated monitoring system shall be of high quality and capable of printing on multi-copy official certificates. The printed information shall be immediately available for review.

(2) All printers printing official documentation shall be under the complete control of FGIS.

**i. FGIS Permissive Requirements.** The term "FGIS Permissive" is defined as a control requiring a physical action or response by official personnel during normal operation to maintain grain flow security (i.e., release of a shipping bin after receiving a grade, consent to proceed with normal operation after obtaining a correct barge number, or consent to proceed with official weighing). FGIS permissives should not be confused with "Interlocks," which are designed into the system but which operate automatically.

The following permissives are required to be designed into the system to give FGIS the necessary controls during operation. This list contains the minimum permissives required and additions may be necessary. FGIS recognizes that there are many ways of obtaining a permissive action during official operation and is not attempting to suggest design. We recognize that time and efficiency are of the essence.

(1) A "Sign-On" permissive is required at the start of each shift which will allow the names or initials of the official operating personnel and the time to be recorded on the event record. Capability for recording changes in personnel are also necessary, however, no delays in operation should be encountered for recording changes in personnel. Sign-on entries shall have password security.

(2) An "OK to Weigh" permissive is required which will prohibit official operation until official personnel are on station, have signed on, and are ready for official operation of the system. This shall be recorded with the time.

(3) A "Fill Complete - Pull Sample" indication is required which will be provided to the official personnel and must be acknowledged. The sampler will be provided with indications of sampler/shipping bin in

start, use, and complete.

- (4) A "SHIP" or "REJECT" permissive is required to prevent release of a shipping bin until a grade is determined and a decision is made to accept or reject the bin. This shall be recorded with the time.
- (5) An "END OF SHIP WEIGH BACK" or "EOSWB" permissive is required to signal the end of the ship and allow any remaining portion of a lot to be officially weighed back to the house. This shall be recorded with the time.
- (6) A "Barge ID Checked" or "Barge ID Recorded" permissive is required to ensure the barge number is checked and properly recorded prior to weighing the barge grain. CCTV is generally used to make this check. This shall be recorded with the time.
- (7) A "Barge Complete" or "Barge Empty" with "Yes/No" permissive is required to ensure the barge has been checked for clean-out and if necessary, an estimate is physically made of remaining grain. This shall be recorded with the time.

j. Alarm Requirements. An alarm is defined as an indication that an improper condition exists within the system; i.e., sampler malfunction, improper flowpath detected, gate opened manually, erratic tare weight detected. The system shall provide for, but not be limited to, the following alarm criteria as defined by FGIS:

- (1) Alarm conditions shall be visible, audible, and printed on the event record.
- (2) The system shall provide for recording of corrective actions taken to relieve alarm conditions.
- (3) The system shall provide for, but not be limited to, the following required alarm conditions:
  - (a) Erratic tare weight.
  - (b) Scale over capacity.

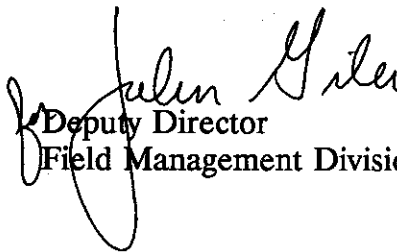
- (c) Scale in test mode.
  - (d) Sampler malfunctions or sampler inoperative.
  - (e) Possible spill alarms for spill areas not covered by CCTV; i.e., plug chute alarm.
  - (f) Improper flow conditions.
  - (g) Unauthorized gate, valve, slide, or other openings.
  - (h) Improper gate, valve, turnhead sets; i.e., double sets.
  - (i) Printer malfunctions.
  - (j) PLC system alarms; i.e., rack fault, PLC processor in program mode, online programming being performed.
- k. Required System Documentation. As defined by FGIS and required under FGIS regulations the following documentation shall be provided to FGIS and will include, but not be limited to:
- (1) One system proposal describing, in detail, the system and the proposed operation.
  - (2) One complete reproducible set of the field wiring diagrams.
  - (3) One complete reproducible set of technical manuals/operating instructions for all hardware and software.
  - (4) One complete set of software programming on all components of the system in diskette form.

## 7. FGIS APPROVAL

FGIS approval of an FCS is provided in writing from the Director, Field Management Division, upon completion of the following requirements:

- a. Successful completion of a 6-month test period initiated by FGIS upon completion of installation and system check-out by the elevator/contractor. During this trial period; problems, corrections, and changes to the system will be documented.

- b. On-the-job training in system operation is provided to FGIS personnel.
- c. Receipt of local Field Office Manager's recommendation for approval of the system by the Weighing and Equipment Branch (WEB).
- d. Receipt of all required documentation by the WEB.

  
Deputy Director  
Field Management Division